

Teacher Notes

Six for Six features 6 sets of complementary resources and/or activity suggestions aligned to curriculum requirements for KS2 & 3 STEM subjects using real-world examples of Siemens technology, engineering or manufacturing principles as basis for learning.

Teachers are invited to select one or more suites of Six for Six materials to be used at their own discretion over the course of a half-term or term.

Each set of six includes:

- Comprehensive teacher notes
 - Introducing and providing an overview of key learning objectives for the six resources and/or activity suggestions
 - Curriculum matrix including learning outcomes
 - Recommendations for when and how to use the resources
 - Links to additional learning opportunities and events associated with the STEM learning framework and calendar
- Six, curated lesson plans, films, interactive learning tools, workshop or challenge event activity suggestions each linked to the other to repeat and reinforce learning opportunities

Download here

Module 1: Understanding the body and how it works – using and interpreting images to understand systems such as digestion and skeletal in the human body.

Module 2: Living in a world made by STEM – looking at the changes made to the world around us by developments in science and technology.

Module 3: Energy for thrills – seeing how the concept of energy transfer can help us make sense of everything from rollercoasters to double deck buses.

Module 4: Power to the people – the quality of our lives depends upon a reliable and cheap supply of energy. This needs to be achieved without damaging the environment however.

Module 5: Getting around – transport systems are crucial to modern life but need careful planning and operation to be fit for purpose. Thought needs to be given to the technology used, organisation and energy sources.

Module 6: Building the things we need – manufacturing skills are crucial to providing the products we need but they also provide jobs and develop skills. Manufacturing uses scientific ideas, logical thinking and an understanding of the wider world.

Module 1: Understanding the body and how it works

Introduction

Children are often fascinated by their own bodies; they provide a rich source of ideas that can be explored to develop scientific understanding. In addition, there is scope for getting them to understand that making the right choices about lifestyle can lead to a longer, healthier and more fulfilling life.

A key aspect of the requirements of the Programme of Study is the study of various systems within the body. If pupils understand how groups of organs function together then they can make sense of why we are the way we are. This can be supported effectively with the use of images of organs, either diagrammatical or photographic; these can tap into pupils' innate curiosity as well as supporting their understanding.

Educational context/curriculum links

This suite of materials is designed to support the teaching of science over a period of time. The resources are gathered together here for sake of convenience but there is no expectation or suggestion that they be used consecutively. Rather the idea is that as and when the topics arise in schemes of learning that the resources are accessed and deployed.

It could be used in a variety of ways including:

- A sequence of lessons delivered by one teacher but drawing upon a number of curriculum areas.
- A special 'STEM event', possibly using a STEM Ambassador or some other visitor to offer a different experience. There are a number of possibilities here – the visitor might for example be a medical expert such as a nurse or doctor, or they could have a background in an area such as health and diet.
- An event using a number of teachers with different activities.

Subject references:

Science

- identify that humans and some other animals have skeletons and muscles for support, protection and movement.
- describe the simple functions of the basic parts of the digestive system in humans
- identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood
- recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function
- describe the ways in which nutrients and water are transported within animals, including humans.

Overview of assets

Type of resource	Title of resource
Lesson plan and activity suggestions	The human body – skeletal muscular system
Interactive learning tool	Inside the human body
Digital Badge reward	Curiosity explorer
Lesson plan and activity suggestions	The human body – digestive system
Lesson plan and activity suggestions	The human body – circulatory system
Lesson plan and activity suggestions	More than skin deep
Links to careers and employment opportunities	Early Careers

Rationale

The key idea with the activities is to get pupils thinking about organs in the body, what their functions are and how they work together in systems. Extensive use is made of images to support explanations but also with the assistance of other types of learning activities. The materials are closely linked with the requirements of the National Curriculum but offer a range of classroom activities, some of which may be less familiar. The idea is to offer an innovative suite of possibilities.

1. Lesson plan: The human body – skeletal muscular system

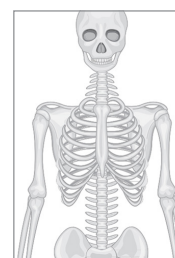
The Human Body

The purposes of this set of learning activities are to develop an understanding of the features of the skeleton, the associated functions and to relate the features to various images. This is a way of engaging pupils and embedding ideas and understanding.

The starting point is the human skeleton. This will be familiar to many pupils, though they may not have fully considered why it is as it is. There is scope for questions about what can be seen and why pupils think it might be that way. Pupils can be challenged to consider what would happen if they didn't have bones in their body and as well as features which are rigid but not bony, such as the nose.

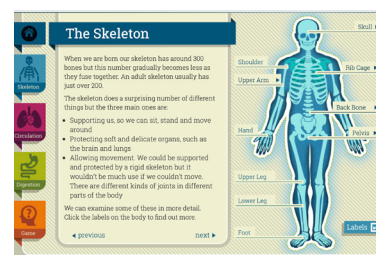
This is developed by asking pupils to compare the human body with that of other animals, such as a beetle, a snail and an octopus. These animals are also capable of movement and need protection but do this in different ways. The contrast can be used to draw out key features of the human skeleton. From this the key functions of protection, support and movement can be drawn out.

This can then be developed by relating the ideas to an image of the skeleton. There are then three activities which are designed to develop an understanding of each of these functions. These use everyday materials; they model various functions and, as such, also represent an important aspect of Working Scientifically.



2. Interactive learning tool: Interactives

The 'Inside the Human Body' resource is one that can be accessed online by anyone from anywhere. It can therefore be used not only in school but also by pupils working at home. It provides an opportunity for them to meet and revisit a series of questions, ideas and images about the working of the body.



3. Digital Badge reward: Curiosity Education

This digital badge is based on the use of various materials to develop an understanding of the working of the body. Pupils can work towards this by considering resources they have used to learn more in the 'Inside the Human Body' activities such as in the MRI learning resource. It could however be used in conjunction with other inventions.

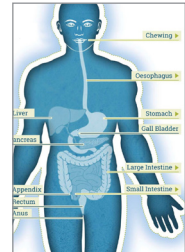


4. Lesson plan: The human body – digestive system

The Human Body

The aims of this set of activities are to get pupils to be able to identify organs in the digestive system and to understand their function. After an introduction there is an activity which models the working of the digestive system using everyday materials. It has the potential to be rather messy but is engaging and, with skilful teaching, can be very effective at developing an understanding of the functioning of the digestive system. It models various stages; to develop an effective understanding there needs to be questions and suggestions to focus attention on parallels with the system in the body.

This activity can be adapted according to the size of the class, the numbers of adults present and the availability of resources. There is significant scope to relate the various stages to images of organs in the body and pupils' own ideas about digestion.

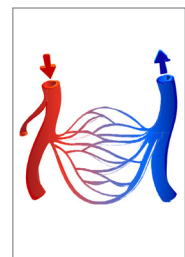


5. Lesson plan: The human body – circulatory system

The Human Body

The principal aims of this set of activities are to get pupils to identify the key features of the system and to understand how it works and why.

The first activity involves pupils in finding their own pulse. Some may find this a little tricky at first but it is worth persisting with as it is a powerful way of relating the ideas to their own bodies.



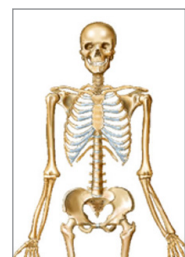
There are then a number of questions for pupils to attempt. They can do this in pairs and with resources available such as the 'Inside the Human Body' interactive. The idea is for them to develop research skills as well as a grasp of the key ideas. They can share what they have found out and how. An important idea here is that of the double circulatory system; the interactive resource is designed to support an understanding of this.

There are supporting resources on the website including activity sheets to support this.

6. Lesson plan: More than skin deep

MRI Experience Lesson Plan

There are two principal aims of this set of activities. The first is to provide pupils with an idea of the nature and purpose of MRI imaging and the second is to develop a positive attitude towards such processes. Although few pupils are likely to have experienced at first hand an MRI scanner. Many will do so during their lifetime. It can be an unnerving experience for some people if pupils develop a better understanding of the insights that can be gained from this technology then they are likely to develop a more positive attitude towards its use.



The theory behind MRI imaging isn't explored at this stage but this doesn't mean that the images can't be used to explain what medical experts may use to support diagnosis. As well as seeing the type of images produced there is also a valuable outcome in terms of aspects of Working Scientifically. An important principle in science (as well as in broader areas) is the notion of trading off risk against value. Medical imaging technologies carry varying levels of risk, depending upon the technique and the characteristics of the patient; it is important to compare the value of the insights gained from the images obtained with the risks to the patient.

The resource is written for a wide range of target age and there is a choice of activities at a number of stages. The earlier ones are primarily designed for younger pupils and will therefore be suitable for KS2. However any of the engagement activities in Episode 2 could be used; they are all intended to develop an understanding of the power of effective imaging. Activity A in Episode 3 has value in not only developing an understanding of basic anatomy but also in revisiting and consolidating understanding from earlier topics on the human body.

Finally the [MRI app](#) can be used to show the value of the images and how they can be used in medical diagnosis.

Best teaching practice

There are various ways in which the resources can be used effectively but there are some key components that should be maintained.

One of these is that it is important to move beyond simply naming parts and memorising functions. This is unlikely to result in deep and long term understanding. It is important that pupils understand why organs and systems are as they are – that they can link form to function. This is why there is significant use of activities which model aspects of organ systems, such as bones protecting organs and the mouth breaking down food. An important point here is not to present these as perfect models but as a way of developing understanding. Asking pupils to consider the extent to which they are good models – what do they represent well and what do they not show as effectively – is a good teaching strategy and one which develops a key aspect of Working Scientifically. Scientists make extensive use of models and not just to show what has been learned; they enable us to test and explore ideas.

This suite of materials also uses different kinds of image. Only using one sort runs the risk of pupils assuming that those are literally true (e.g. that arteries and veins are blue and red). The interpretation of images develops visual literacy which is important.

There is also an important subtext running throughout in the form of healthy living and making responsible decisions. Pupils should be learning about how their bodies function, not simply to develop theoretical understanding but also to inform decisions about aspects of lifestyle such as diet and fitness. There are various opportunities to draw attention to these.

The activity sheets on the website are designed to embed an understanding of the key ideas; they are suitable for use either in school or at home.

Links to careers and employment opportunities

Although it will be some years before pupils make crucial decisions about subjects they study at school, research shows that they often form attitudes towards STEM subjects at an early stage. It is useful if early interest can be nurtured and if pupils can be supported to see themselves as potentially being active in this area. For aligned resources relating to STEM careers see 'Raising Aspirations, Inspiring Futures' developed in collaboration with the Personal Social Health Education (PSHE) Association at [See Women](#)

Find out more at [Siemens Early Careers](#)





Further reference

The 'Inside the Human Body' interactive and the Patient Experience Matters app.

There is a range of materials that can be used to support pupils' understanding of the workings of the human body. These include simplified diagrams and quizzes. A useful and free resource in the National STEM Centre e-library at: www.stem.org.uk/resources

There are other materials available too, such as velcro tabards with soft organs to attach and plastic hearts that can be squeezed to pump water with red food colouring.

There is also scope for enlisting the support of healthcare professionals who may be able to come into school and talk to pupils. Some well chosen visual aids go a long way here, such as X rays of fractured bones.

Suite No.		1	2	3	4	5	6
Phase		Primary	Primary	Secondary	Secondary	Secondary	Secondary
Focus		STEM	STEM	Science	Design Technology	STEM	STEM
Module:		1	2	3	4	5	6
Title		Understanding the body and how it works	Living in a world made by STEM	Energy for thrills	Power to the people	Getting around	Building the things we need
Asset #1	Lesson plan and activity suggestions	The human body - skeletal muscular system	Clean silent trains	Formula for thrills	E-zero Island	Inspired bus company	Keeping it lean and mean
Asset #2	Lesson plan and activity suggestions	The human body – digestive system	Bus activity sheet	Monte Rosa Mountain Hut	Interactive learning tool. Energy Island	Green power challenge	Totally in control
Asset #3	Interactive learning tool	Inside the Human Body	Life without STEM	Formula for thrills	Siemens Farm	Self driving challenge	Lean machines
Asset #4	Digital Badge reward	Curiosity	Technology	Rollercoaster challenge	Energy Challenger	On the move Challenger	Mechatronics Challenger
Asset #5	Lesson plan and activity suggestions	The human body – circulatory system	Words along wires	Here comes the Sun	Blowing in the Wind	Ringing true	A case to resolve
Asset #6	Lesson plan and activity suggestions	More than skin deep	Let there be light	Blowing in the Wind	Underwater Energy	A case to resolve	Sustainability